

ICTs and Economic Growth: Rethinking Digitalization Strategies for Faster Economic Recovery

Presented by:

Monzur Hossain

Research Director

Bangladesh Institute of Development Studies (BIDS)

December 1, 2021

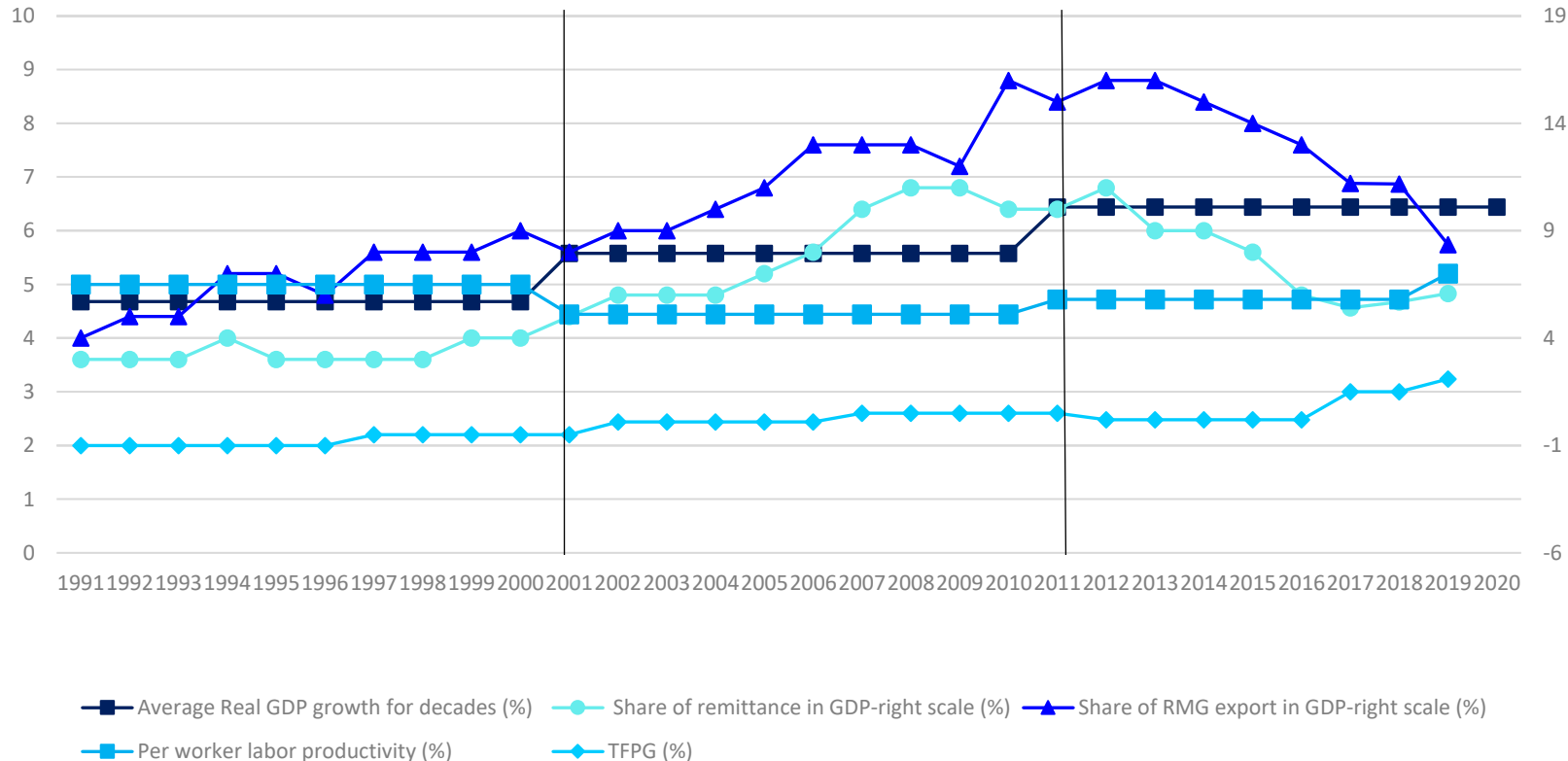
Context of the Study...

- Digital Bangladesh Vision—A big push for digitalization since 2009 as a shifting development strategy
- Policy reforms and substantial investments in ICTs are made
- Significant improvement of ICT indicators: mobile phone penetration, tele-density, internet use, e-governance etc.
- A significant economic growth in the last decade, over 6% in tandem with faster growth of adoption of mobile phone and digitalization
- Digitalization and innovation influences various sectors and the economy: Direct and indirect channels
- Production of goods and services within the ICT sector directly contributes to the creation of value-added goods and services in the economy
- Further, the use of ICT goods and services as inputs in the production of other goods and services increases productivity of that sector which contributes to improving efficiency and productivity of the economy as a whole

Context of the Study.....

- With the declining share of RMG and remittances over the last decade 2010 and onwards, a widespread adoption of ICTs might contribute to the improvement of total factor productivity and labor productivity growth at the same time (Figure 1)
- In the absence of any discernable policy reforms, digitalization could be one explanation to the incremental growth in the 2010s—by increasing investments and efficiency of capital
- There are various international evidences that ICTs contribute to economic growth significantly—postwar economic growth in the USA was fueled by ICTs and semiconductor industry
- IT-producing industries contributed 7.6 percent of postwar economic growth and 32.8 percent of postwar productivity growth in the USA (Jorgenson et al, 2016). In India, software service exports constituted 45 percent of total eservice exports and 3.5 percent of GDP in 2012 (Erumban and Das, 2016).
- The main objective of this study is thus to capture the contribution of ICTs and subsequent digitalization on Bangladesh's TFP and economic growth.

Figure-1: Drivers of Economic Growth



- The decade of 2010 saw an increment in GDP growth (over 6%) compared to the previous decades
- The share of RMG export as a percentage of GDP was overall on the rise in the previous decades but has been declining after 2010.
- The share of remittance as a percentage of GDP has also been decreasing with a slight increase during 2019.
- Total factor productivity and labor productivity growth has been gradually increasing after 2010 and onwards highlighting the inception of Digital Bangladesh Vision.

Some selected ICT indicators, 2010-2020

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	CAGR (%)	Change over 10 years (%)
Fixed broadband subscriptions (per 100 people) ¹	0.3	0.31	0.39	0.99	2.00	3.13	4.17	4.57	4.99	4.95	5.78	30.85	1826.00
Fixed telephone subscriptions (per 100 people) ²	0.9	0.65	0.63	0.70	0.63	0.55	0.48	0.44	0.89	0.89	0.88	-0.20	-2.22
Mobile cellular subscriptions (per 100 people) ³	46	56.52	64.36	76.30	82.10	84.07	86.08	94.53	100.24	101.54	103.31	7.63	124.56
Individuals using the Internet (% of population) ⁴	--	--	20.2	23.4	28.2	34.6	42.2	50.4	56.6	61.0	67.9	14.4	236.14
Tele-density(overall)	44.6	47.8	61	64.64	77.81	79.3	81.48	87.32	96.36	97.10	99.68 ⁶	7.58	123.50

Literature Review

A study of the World Economic Forum indicates that an increase in the digitization of a country by 10% would lead to a 0.75% increase in GDP per capita, and a 1.02% drop in the unemployment rate. (World Economic Forum, 2013).

According to the OECD, ICT plays a major role in reducing poverty by creating new sources of income and new jobs, and also by reducing the cost of poor people's access to health and education services (OECD, 2010).

In a study, the authors found that a 10% increase in the broadband penetration rate would cause an annual GDP per capita growth of 0.9–1.5% (Czernich, kretschmer and Woessmann, 2009).

Nasab and Aghaei investigated the impact of investments in ICT on economic growth in seven OPEC member countries for the period 1990-2007 and found a significant and positive impact on economic growth (Nasab and Aghaei, 2009).

Hossain and Samad (2021) found that mobile phone use increases household income (3 to 10 percent) from different sources, such as small businesses and remittances; improves women's empowerment; and facilitates consumption smoothing during periods of shocks

Methodological Aspects: Assessing the contribution of ICTs on GDP

- To estimate the contribution of ICT investment to growth, the aggregate growth has been decomposed into the contribution of inputs of capital and labor services and total factor productivity (TFP), defined as output per unit of all inputs as suggested by Jorgenson, Ho, and Stiroh (2008)
- In the production function, output (Y) is produced by an input bundle (F) of capital services rendered by ICT capital (k_{ICT}) and non-ICT capital (k_{NICT}), and labor services comprised of hours worked (W) and labor quality (l_Q). Total input (F) is augmented by total factor productivity (A) or output per unit of inputs of both capital and labor services.

$$Y = A \cdot F(k_{ICT}, k_{NICT}, W, l_Q) \quad (1)$$

Methodological Aspects: Assessing the contribution of ICTs on GDP

- Under the assumption of perfect competitive factor markets where the marginal product of each input equals its price and constant returns to scale, Eq. (1) can be transformed into the growth accounting Eq. (2)

$$\Delta \ln Y = \omega_k \Delta \ln k + \omega_l \Delta \ln l + \Delta \ln A$$

$$= \omega_{k_{ICT}} \Delta \ln k_{ICT} + \omega_{k_{NICT}} \Delta \ln k_{NICT} + \omega_l \Delta \ln W + \omega_l \Delta \ln l_Q + \Delta \ln A \quad (2)$$

- Where ω denotes the two-period average shares of total factor income
- $\Delta \ln$ of a variable denotes its real growth rate.
- The assumption of constant returns to scale of the aggregate input function implies that

$$\omega_{kZ} + \omega_l = 1 \quad (\omega_k = \omega_{k_{ICT}} + \omega_{k_{NICT}}).$$

Methodological Aspects: Assessing the contribution of ICTs on GDP

➤ The growth accounting Eq. (2) implies that GDP growth can be decomposed into three main sources:

- Contribution of capital inputs, which consists of the contributions of ICT and non-ICT capital:

$$\omega_k \Delta \ln k = \omega_{k_{ICT}} \Delta \ln k_{ICT} + \omega_{k_{NICT}} \Delta \ln k_{NICT}$$

- Contribution of labor input, which comprises the contributions of hours worked and labor quality:

$$\omega_l \Delta \ln l = \omega_l \Delta \ln W + \omega_l \Delta l', \text{ and}$$

- Contribution of TFP growth, $\Delta \ln A$

Methodological Aspects: Assessing the contribution of ICTs on GDP growth

The production function at the industry level, can be decomposed into contributions from capital (k), labor (l) and intermediate input (F) as

$$\Delta \ln Y_i = \gamma_{k,i} \Delta \ln k_i + \gamma_{l,i} \Delta \ln l_i + \gamma_{F,i} \Delta \ln F_i + \Delta \ln A_i \quad (3)$$

- In Eq. (3), aggregate output can be replaced by the aggregate value-added growth, which is the sum of the weighted contribution of industry capital input, industry labor input and industry TFPG.
- Industry TFP improvement can have a direct effect through industry output, but also an indirect effect through output in other industries, by means of intermediate input sold to other industries (Jorgenson et al., 2007).

Methodological Aspects: Assessing the contribution of ICTs on GDP

Sector wise ICTs Contribution to GDP in Bangladesh

- Going by the standard definition of ICT sectors, following Erumban and Das (2016), the total market economy was defined into seven categories as per their contribution in terms of total GDP.
 - ICT producing sectors
 - ICT using manufacturing
 - Non-ICT using manufacturing
 - ICT using services
 - Non-ICT market services
 - Non-ICT services
 - Non-ICT others

Table 1. Share of different sectors to GDP attributing to ICTs in Bangladesh

%	2005-2009	2010-2014	2015-2019
ICT producing sectors	1.84	2.56	2.64
ICT using manufacturing	0.70	0.61	0.62
ICT using services	11.29	11.00	10.87
Non-ICT manufacturing	15.80	16.19	16.73
Non-ICT market services	7.36	7.51	7.95
Non-ICT services	34.87	34.71	34.64
Non-ICT others	28.01	26.89	25.22
Total	99.87	99.48	98.67

Findings/Results

- Total share of ICT related sectors is about 13% in Bangladesh, while it is about 26% in India
- The share of ICT producing sector has increased from 1.84 % in 2005-2009 to 2.64 % in 2015-2019
- The largest increase in the share of ICT producing sectors has been observed in post and telecommunications services (from 1.3% to 2.6%).
- ICT using sectors (both manufacturing and services), constituted about 12.0% of total GDP (employment) in 2005-2009, which increased to 19% in 2015-2019.
- ICT producing industries, (which includes electrical and optical equipment manufacturing and telecommunication services), increased their share in GDP (employment) from 1.83% in 2005-2010 to 2.64% in 2015-2019 period.
- Clearly, the ICT sector, though the size of ICT producing sector is small, show a remarkable increase both in employment generation and GDP over time, substantiating the importance of this sector for Bangladesh economy.

Estimating the Determinants of TFPG in Bangladesh

- To assess the role of ICTs in TFP growth, the TFP growth series of Ahmed and Chowdhury (2019) was applied—one is estimated by the OLS (Ordinary Least Square) and the other one estimated by ARDL (Autoregressive Distributed Lag) at their first differences.

$$D\ln A = D\ln Y - [\alpha(D\ln k + (1 - \alpha)(D\ln l + D\ln W)]$$

$$D\ln A = D\ln y - \alpha D\ln k$$

Estimating the Determinants of TFPG in Bangladesh

Table-2 Determinants of TFP Growth

	(1)	(2)	(3)	(4)
VARIABLES	dlna_ols_alpha68 beta29	dlna_ardl_alpha65b eta26	dlna_ardl_alpha65bet a26	dlna_ols_alpha68beta2 9
D.teledensity penetration	-0.039** (-2.67)	-0.037** (-2.63)	0.013* (11.06)	0.013* (8.67)
D.ict service exports as % of service export	-0.001 (-0.86)	-0.001 (-0.83)	0.001** (24.52)	0.001** (19.94)
D.govt consumption net of schooling aso	-0.002 (-1.06)	-0.002 (-1.09)	0.001** (17.47)	0.001** (14.45)
D.voice and accountability_epol	0.045***	0.042***	-0.025**	-0.024**

Estimating the Determinants of TFPG in Bangladesh

D.regulatory control_epol	-0.020	-0.019	-0.013*	-0.014*
	(-0.76)	(-0.73)	(-7.95)	(-7.34)
D.control of corruption_epol	0.007	0.008	-0.006	-0.007
	(1.03)	(1.06)	(-5.23)	(-4.88)
D.broadmoney total of gdp	-0.001	-0.001	-0.001**	-0.001*
	(-1.49)	(-1.37)	(-15.26)	(-11.66)
D.trade liberalization	0.000	0.000		
	(1.41)	(1.45)		
D.fixed broadband subscriptions			-0.000**	-0.000**
			(-39.72)	(-30.58)
Constant	-0.003	0.001	0.003**	-0.001
	(-1.78)	(0.53)	(24.31)	(-3.69)
Observations	21	21	10	10
R-squared	0.598	0.585	1.000	0.999

Robust t-statistics in parentheses;*** p<0.01, ** p<0.05, * p<0.1

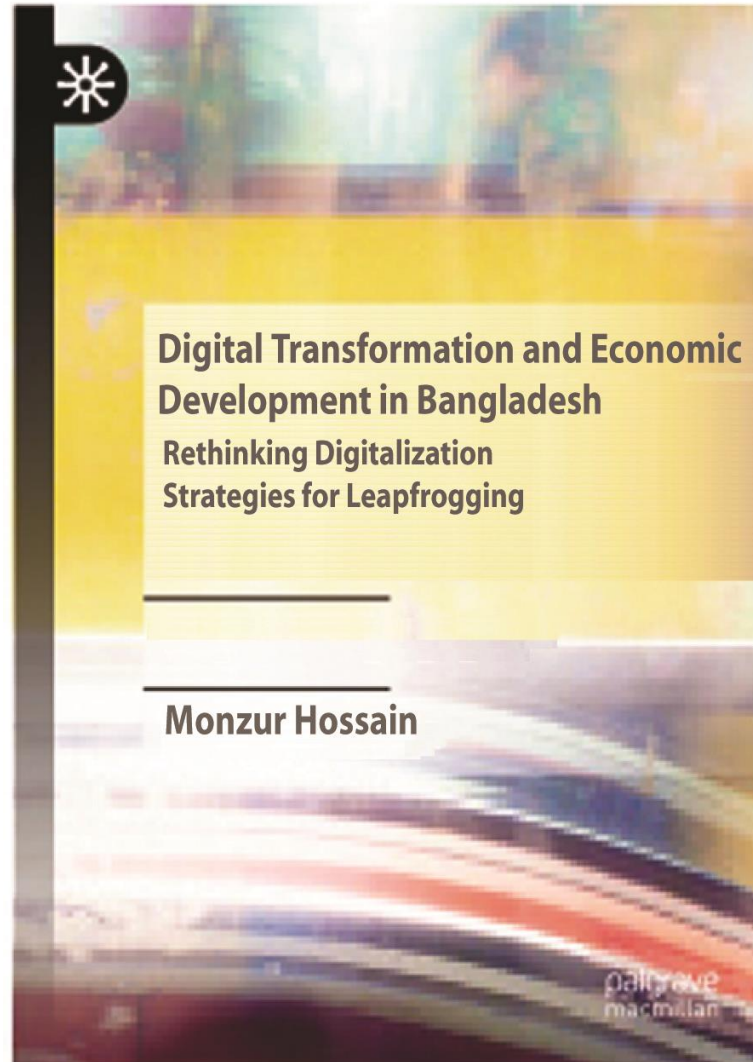
Estimating the Determinants of TFPG in Bangladesh

- The study makes four specifications to assess the role of ICT on TFPG. The first two specifications consider data for 21 years while the last two specifications consider data for 10 years as fixed broadband data are available since then (Table-2).
- In the first two specifications, the change in tele-density penetration and percentage share of ICT exports to total exports are found to be negative on TFP growth. However, as fixed broadband data is entered into the model for 2010 onward, both tele-density and ICT exports are found to be positive on TFP growth, yet, fixed broadband is still negative to TFP growth.
- As most people are using mobile data for internet and fixed broadband remains inaccessible in rural and semi-urban areas so far, its negative impact on TFP growth may be expected.
- Though the number of observations is small for the third and fourth specifications, it portrays the expected impact of digitalization on productivity through enhancing efficiency in various sector.

Conclusions

- The paper attempts to conceptualize the impact of digitization on the economic growth in Bangladesh
- This is the first effort to capture the impact of digitalization on the TFP growth concluding that, tele-density and ICTs have significant impact on TFP growth and thus the overall GDP growth as well.
- The findings suggest that massive digitalization efforts contributed positively to the TFP growth and overall GDP growth
- This finding is important to shed light to the fact that in the absence of any significant reforms in the 2010s, the only visible policy changes with necessary investments are made in the ICT sector and digitalization process.
- However, it is important to focus more on ICT producing sectors and ICT using manufacturing sectors with possible fiscal and monetary policy incentives to encourage them for large scale automation leading to innovations
- An enormous benefits of digitalization has been observed during the COVID-19 crisis, and therefore, for faster recovery, digitalization efforts need to be strengthened
- The digital economy could promote development potentials and harness new development opportunities in more remote and economically lagging regions, leading to an inclusive and balanced growth

This presentation is made on a chapter of the forthcoming book of the author from Palgrave Macmillan:



Thank You